

WHAT IS CLAIMED IS:

1. A method for managing a virtual heap in a virtual machine executing within a device, the method comprising:

5 executing a process within the virtual machine;

 providing the virtual heap for the process, wherein the virtual heap comprises a store heap comprising a first plurality of cache lines for storing objects for the process, and wherein the virtual heap further comprises an in-memory heap comprising a second plurality of cache lines for caching objects for access by the process during execution, and
10 wherein the store heap and the in-memory heap are comprised in one memory address space, and wherein a cache line is the smallest addressable unit of memory within the memory address space comprising the store heap and the in-memory heap;

 caching objects for the process executing within the virtual machine in the in-memory heap;

15 the process modifying a first one of the objects for the process in a first cache line in the in-memory heap; and

 flushing the first cache line from the in-memory heap to the store heap subsequent to said modifying the first one of the objects.

20 2. The method of claim 1,

 wherein said flushing the first cache line from the in-memory heap to the store heap comprises:

 moving the first cache line from the in-memory heap to a cache I/O buffer, wherein the cache I/O buffer is configured to store modified cache lines from the in-memory heap; and
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 writing one or more of the modified cache lines, including the first cache line, from the cache I/O buffer to the store heap.

3. The method of claim 2,

wherein said writing the one or more of the modified cache lines, including the first cache line, from the cache I/O buffer to the store heap comprises:

overwriting the first cache line in the store heap with the first cache line from the cache I/O buffer.

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4. The method of claim 1,

wherein the in-memory heap comprises a plurality of regions, wherein each region comprises one or more of the second plurality of cache lines;

the method further comprising:

10 the process creating, in a first region of the plurality of regions in the in-memory heap, a new object;

moving the new object from the first region of the in-memory heap to a second region of the in-memory heap; and

15 flushing the second region of the in-memory heap including the new object to the store heap.

5. The method of claim 1,

wherein the objects for the process comprise code and data for use by the process during execution within the virtual machine.

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6. The method of claim 1,

wherein the store heap is one of a plurality of store heaps in a persistent store;

wherein each of the plurality of store heaps is associated with one of a plurality of processes;

25 wherein the process is one of the plurality of processes.

7. The method of claim 1,

wherein the store heap is comprised in a non-volatile memory coupled to the device.

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8. The method of claim 7,
wherein the non-volatile memory is a flash memory addressable in block
writes, wherein a block write is of a fixed amount of the flash memory, wherein the fixed
amount of the flash memory is a block write size; and

5 wherein the first plurality of cache lines in the store heap and the second plurality
of cache lines in the in-memory heap are of the block write size of the flash memory.

9. The method of claim 1,
wherein the device is a mobile computing device.

10 10. The method of claim 1,
wherein the virtual machine is a Java virtual machine; and wherein the process is
a Java application.

15 11. The method of claim 1,
wherein a cache line comprises one or more objects; and
wherein the cache line is the smallest unit of memory moved between the in-
memory heap and the store heap.

20 12. A system comprising:
a device configured to execute a virtual machine, wherein the virtual machine is
configured to execute a process;

a first memory coupled to the device, wherein the first memory is configured to
store a store heap for the process, and wherein the store heap is comprised within a virtual
25 heap for the process, and wherein the store heap comprises a first plurality of cache lines
for storing objects for the process;

a second memory coupled to the device, wherein the second memory is configured
to store an in-memory heap for the process, and wherein the in-memory heap is
comprised within the virtual heap, and wherein the in-memory heap comprises a second
30 plurality of cache lines for caching objects for access by the process during execution;

wherein the store heap and the in-memory heap are comprised in one memory address space, and wherein a cache line is the smallest addressable unit of memory within the memory address space comprising the store heap and the in-memory heap;

wherein the device is further configured to execute a virtual machine virtual
5 memory manager, wherein the virtual machine virtual memory manager is configured to:

cache objects for the process executing within the virtual machine in the in-memory heap;

wherein the process is configured to:

modify a first one of the objects for the process in a first cache line in the
10 in-memory heap; and

wherein the virtual machine virtual memory manager is further configured to:

flush the first cache line from the in-memory heap to the store heap subsequent to said modifying the first one of the objects.

15 13. The system of claim 12,

wherein, in flushing the first cache line from the in-memory heap to the store heap, the virtual machine virtual memory manager is further configured to:

move the first cache line from the in-memory heap to a cache I/O buffer, wherein the cache I/O buffer is configured to store modified cache lines from the in-
20 memory heap; and

write one or more of the modified cache lines, including the first cache line, from the cache I/O buffer to the store heap.

14. The system of claim 13,

25 wherein, in writing the one or more of the modified cache lines, including the first cache line, from the cache I/O buffer to the store heap, the virtual machine virtual memory manager is further configured to:

overwrite the first cache line in the store heap with the first cache line from the cache I/O buffer.

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15. The system of claim 12,
wherein the in-memory heap comprises a plurality of regions, wherein each region
comprises one or more of the second plurality of cache lines;

wherein the process is further configured to:

5 create, in a first region of the plurality of regions in the in-memory heap, a
new object; and

wherein the virtual machine virtual memory manager is further configured to:

move the new object from the first region of the in-memory heap to a
second region of the in-memory heap; and

10 flush the second region of the in-memory heap including the new object to
the store heap.

16. The system of claim 12,

wherein the objects for the process comprise code and data for use by the process
15 during execution within the virtual machine.

17. The system of claim 12,

wherein the first memory comprises a persistent store configured to store a
plurality of store heaps, and wherein each of the plurality of store heaps is associated with
20 one of a plurality of processes, and wherein the store heap for the process is one of the
plurality of store heaps, and wherein the process is one of the plurality of processes.

18. The system of claim 12,

wherein the first memory is a flash memory addressable in block writes, wherein a
25 block write is of a fixed amount of the flash memory, wherein the fixed amount of the
flash memory is a block write size; and

wherein the first plurality of cache lines in the store heap and the second plurality
of cache lines in the in-memory heap are of the block write size of the flash memory.

30 19. The system of claim 12,

wherein the device is a mobile computing device.

20. The system of claim 12,
wherein the virtual machine is a Java virtual machine; and wherein the process is
5 a Java application.

21. The system of claim 12,
wherein a cache line comprises one or more objects; and
wherein the cache line is the smallest unit of memory moved between the in-
10 memory heap and the store heap.

22. A carrier medium comprising programming instructions executable to
manage a virtual heap on a virtual machine executing within a device, wherein the
program instructions are executable to implement:

15 providing the virtual heap for a process executing within the virtual machine,
wherein the virtual heap comprises a store heap comprising a first plurality of cache lines
for storing objects for the process, and wherein the virtual heap further comprises an in-
memory heap comprising a second plurality of cache lines for caching objects for access
by the process during execution, and wherein the store heap and the in-memory heap are
20 comprised in one memory address space, and wherein a cache line is the smallest
addressable unit of memory within the memory address space comprising the store heap
and the in-memory heap;

caching objects for the process executing within the virtual machine in the in-
memory heap; and

25 flushing a first cache line from the in-memory heap to the store heap subsequent
to the process modifying a first one of the objects for the process in the first cache line in
the in-memory heap.

23. The carrier medium of claim 22,

wherein, in flushing the first cache line from the in-memory heap to the store heap, the program instructions are further executable to implement:

moving the first cache line from the in-memory heap to a cache I/O buffer, wherein the cache I/O buffer is configured to store modified cache lines from the in-memory heap; and

writing one or more of the modified cache lines, including the first cache line, from the cache I/O buffer to the store heap.

24. The carrier medium of claim 22,

wherein the in-memory heap comprises a plurality of regions, wherein each region comprises one or more of the second plurality of cache lines;

wherein the program instructions are further executable to implement:

moving a new object, created by the process in a first region of the plurality of regions in the in-memory heap, from the first region of the in-memory heap to a second region of the in-memory heap; and

flushing the second region of the in-memory heap including the new object to the store heap.

25. The carrier medium of claim 22,

wherein the store heap is one of a plurality of store heaps in a persistent store;

wherein each of the plurality of store heaps is associated with one of a plurality of processes;

wherein the process is one of the plurality of processes.

26. The carrier medium of claim 22,

wherein the store heap is comprised in a flash memory coupled to the device;

wherein the flash memory is addressable in block writes, wherein a block write is of a fixed amount of the flash memory, wherein the fixed amount of the flash memory is a block write size; and

wherein the first plurality of cache lines in the store heap and the second plurality of cache lines in the in-memory heap are of the block write size of the flash memory.

27. The carrier medium of claim 22,
5 wherein the device is a mobile computing device; and
wherein the virtual machine is a Java virtual machine; and wherein the process is a Java application.

28. The carrier medium of claim 22,
10 wherein a cache line comprises one or more objects; and
wherein the cache line is the smallest unit of memory moved between the in-memory heap and the store heap.